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# Laboratory pH Electrode Selection Guide

Repeatable and trusted pH electrodes for the laboratory

pH is one of the most fundamental parameters that is measured in nearly every application. However, there are different electrode requirements for different applications. Due to these various requirements, YSI has a whole suite of laboratory combination pH electrodes to choose from to ensure you select an electrode that meets the demands of your application.

This electrode comparison guide provides a description of each component of a pH electrode, an overview of each YSI lab electrode family, and specifications for each YSI electrode. Please consult the YSI Laboratory pH Electrode Application Guide for additional assistance in selecting a pH electrode and the YSI pH Handbook for practical guidance regarding the measurement of pH.

## pH Electrode Design

Choosing the right electrode for your needs begins with an understanding of the different structures that make up a pH electrode.

### Temperature sensor (optional):

Some electrodes feature an integrated temperature sensor. pH values are dependent on temperature, so pH measurements should always be completed with an accurate temperature sensor.

### Reference electrolyte:

The electrolyte has connection to the sample through the junction. Potassium chloride (KCl) is the most common electrolyte used and can be in the form of liquid or gel. Liquid electrolyte provides faster measurement results and decreases the possibility of measurement errors due to diffusion potentials.

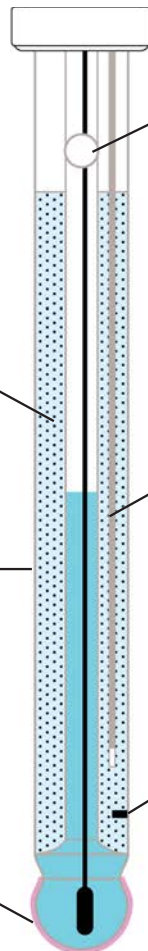
### Electrode body:

Plastic body electrodes are more rugged, less likely to crack, and commonly feature gel electrolyte. Glass body electrodes have a wider range of operating temperatures and many are refillable.

### Glass membrane:

Specialized glass that is sensitive to hydrogen ion activity. Filled with buffer of known pH, creating an environment of constant binding of hydrogen ions on the inside while the sample outside has a variable amount of hydrogen ions. This difference in hydrogen ions creates an electrical potential.

The shape of the membrane can vary in order to ensure optimal moistening. Unique applications may require a specialized membrane shape.



### Refill opening (optional):

Since electrolyte escapes through the junction, electrodes that can be refilled with liquid electrolyte have a longer life than non-refillable electrodes.

### Reference electrode:

Designed to maintain a constant electrical potential. The difference in electrical potential between the reference and sensing electrode results in a voltage that is used to calculate a pH value.

The silver/silver chloride reference system is the most common, although the iodine/iodide system has many advantages.

### Reference junction:

Allows for electrical contact between the reference electrode and the solution. Slightly permeable to prevent electrolyte from escaping too quickly. Different junctions are available, each with unique characteristics.

## YSI pH Electrode Families

YSI has four different families of combination pH electrodes from which to choose, each with unique characteristics. The IDS electrodes are designed for use with the YSI MultiLab, a multiparameter digital lab instrument. IoLine, TruLine, and Science electrodes feature BNC connection and are designed for use with the YSI TruLab, although they can be connected to the MultiLab via a BNC adapter.

### MultiLab IDS

- Intelligent digital sensors (IDS) for the YSI MultiLab
- Store calibration status and serial number, even if disconnected from the meter
- Double-junction with Ag/AgCl reference system
- All electrodes have an integrated temperature sensor
- Available in gel-filled or liquid electrolyte versions; glass or plastic body



YSI IDS 4110



YSI IoLine Electrodes

- Designed for use in Tris Buffer and protein solutions - unique iodine/iodide reference system prevents clogging of the junction
- Reference system and the platinum junction provide excellent stability, fast response times, and high accuracy
- Triple junction design increases measurement security
- Available in a micro version for small sample sizes
- Useful in nearly any application and at a wide-range of temperatures
- BNC connector; compatible with any pH meter that has a BNC input

### Science

- Designed for use in unique applications that require a particular junction
- Features the Silamid reference system, a unique construction of the Ag/AgCl reference system resulting in a more stable and longer lasting electrode with a fast response
- Double-junction reference and integrated temperature sensor
- Ground-joint junction with a fast electrolyte outflow is specifically designed for samples high in solids or with low ionic strength
- Platinum junction for applications that do not require a rate of electrolyte outflow as fast as the ground-joint
- BNC connector; compatible with any pH meter that has a BNC input

YSI Science Electrodes



YSI TruLine Electrodes



### TruLine

- Designed for use in typical laboratory applications
- Single-junction electrodes with Ag/AgCl reference system
- Integrated temperature sensor option
- Durable electrodes with gel electrolyte for general use; liquid electrolyte sensors for more critical measurements
- Electrodes with special membranes for unique applications
- BNC connector; compatible with any pH meter that has a BNC input

# YSI pH Electrode Comparison

The following comparison is designed to assist in selecting the electrode that best fits your needs. For additional information, the manual for each electrode can be found on YSI.com.

	Electrode	Item Number	Connector	Shaft	Refillable	Temp Sensor	Reference System	Junction Type	Number of Junctions	Membrane Shape	Reference Electrolyte
IDS	4110	103740Y	Digital	Plastic (PPE/PS)	No	Yes	Ag/AgCl	Fiber	Double	Cylindrical	Gel, KCl
	4110-3	103741Y	Digital	Plastic (PPE/PS)	No	Yes	Ag/AgCl	Fiber	Double	Cylindrical	Gel, KCl
	4120	103750Y	Digital	Plastic (Polyamide)	Yes	Yes	Ag/AgCl	Ceramic	Double	Cylindrical	Liquid, 3 M KCl
	4130	103780Y	Digital	Glass	Yes	Yes	Ag/AgCl	Platinum	Double	Conical	Liquid, 3 M KCl
IoLine	IoLine	400358	BNC	Glass	Yes	Yes	Iodine/Iodide	Platinum	Triple	Sphere (bulb)	Liquid, 3 M KCl**
	IoLine Micro	400359	BNC	Glass	Yes	Yes	Iodine/Iodide	Platinum	Triple	Cylindrical	Liquid, 3 M KCl**
TruLine	pH 15	400350	BNC	Glass	Yes	Yes	Ag/AgCl	Platinum	Single	Conical	Liquid, 3 M KCl
	pH 17	400351	BNC	Glass	Yes	No	Ag/AgCl	Platinum	Single	Conical	Liquid, 3 M KCl
	pH 25	400353	BNC	Plastic (PPE/PS)	No	No	Ag/AgCl	Fiber	Single	Cylindrical	Gel, KCl
	pH 26	400352	BNC	Plastic (PPE/PS)	No	Yes	Ag/AgCl	Fiber	Single	Cylindrical	Gel, KCl
	pH 21	400357	BNC	Plastic (PPE/PS)	No	No	Ag/AgCl	Hole	Single	Spear tip	Polymer
	pH 27	400354	BNC	Glass	No	No	Ag/AgCl	KPG annular gap	Single	Flat	Polymer
Science	pHT-Pt	400360	BNC	Glass	Yes	Yes	Silamid**	Platinum	Double	Sphere (bulb)	Liquid, 3 M KCl
	pHT-G	400361	BNC	Glass	Yes	Yes	Silamid**	Ground Joint	Double	Sphere (bulb)	Liquid, 3 M KCl
	pHT-Micro	400362	BNC	Glass	Yes	Yes	Silamid**	Platinum	Double	Cylindrical	Liquid, 3 M KCl

\* The Silamid® is a special type of double junction electrode that utilizes a unique construction of the silver/silver chloride reference system.

\*\* The YSI IoLine electrode design allows for the use of other electrolytes (e.g. 0.6 M potassium sulfate) that meet the demands of the sampling application.

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## YSI TruLab



The IoLine, TruLine, and Science pH electrodes feature BNC connection and are compatible with any pH meter that has a BNC input, such as YSI TruLab meters. A BNC adapter (108132Y) also allows these electrodes to be connected to the MultiLab 4010-2 and 4010-3.

IDS pH electrodes feature a digital connector and are designed for use with the YSI MultiLab, a multiparameter digital instrument.

## YSI MultiLab



	Instrument Model	Description
MultiLab	4010-1*	One channel multiparameter digital instrument with memory and USB port
	4010-2	Two channel multiparameter digital instrument with memory and USB port
	4010-3	Three channel multiparameter digital instrument with memory and USB port
TruLab	1110	One channel pH/mV instrument
	1310*	One channel pH/mV instrument with memory and USB port
	1320*	Two channel pH/mV/ISE instrument with memory and USB port

\*There is an integrated printer option for the MultiLab 4010-1, TruLab 1310, and TruLab 1320.

	Electrode	Item Number	Temp. Sensor Connector	pH Range	Temp. Range	Length	Diameter	Minimum Immersion Depth*	Cable Length (meter)	Warranty (months)
IDS	4110	103740Y	Included in digital connection	0 ... 14	0 ... 80 °C	120 mm	12 mm	12-13 mm	1.5	12
	4110-3	103741Y	Included in digital connection	0 ... 14	0 ... 80 °C	120 mm	12 mm	12-13 mm	3	12
	4120	103750Y	Included in digital connection	0 ... 14	0 ... 80 °C	120 mm	12 mm	12-13 mm	1.5	12
	4130	103780Y	Included in digital connection	0 ... 14	0 ... 100 °C	120 mm	12 mm	16-18 mm	1.5	12
IoLine	IoLine	400358	Banana plug	0 ... 14	-5 ... 100 °C	120 mm	12 mm	15-16 mm	1	12
	IoLine Micro	400359	Banana plug	0 ... 14	-5 ... 100 °C	top: 70 mm bottom: 130 mm	top: 12 mm bottom: 6 mm	10-11 mm	1	12
TruLine	pH 15	400350	Banana plug	0 ... 14	0 ... 100 °C	120 mm	12 mm	16-18 mm	1	12
	pH 17	400351	N/A (no temp. sensor)	0 ... 14	0 ... 100 °C	120 mm	12 mm	16-18 mm	1	12
	pH 25	400353	N/A (no temp. sensor)	0 ... 14	0 ... 80 °C	120 mm	12 mm	12-13 mm	1	12
	pH 26	400352	Banana plug	0 ... 14	0 ... 80 °C	120 mm	12 mm	12-13 mm	1	12
	pH 21	400357	N/A (no temp. sensor)	2 ... 13	0 ... 80 °C	top: 65 mm bottom: 25 mm	top: 15 mm bottom: 5 mm	11-12 mm	1	12
	pH 27	400354	N/A (no temp. sensor)	2 ... 13	0 ... 50 °C	120 mm	12 mm	N/A (flat membrane)	1	12
Science	pHT-Pt	400360	Banana plug	0 ... 14	-5 ... 100 °C	170 mm	12 mm	17-19 mm	1	12
	pHT-G	400361	Banana plug	0 ... 14	-5 ... 100 °C	170 mm	12 mm	12-14 mm	1	12
	pHT-Micro	400362	Banana plug	0 ... 14	-5 ... 100 °C	top: 70 mm bottom: 130 mm	top: 12 mm bottom: 5 mm	10-11 mm	1	12

\* Minimum immersion depth is the distance from the tip of the membrane to the outer junction. The junction must always be completely immersed when taking a measurement.



YSI calibration buffers are available in pH values of 4, 7, and 10.

003821	pH 4 Buffer (box of 6 pints)
003822	pH 7 Buffer (box of 6 pints)
003822	pH 10 Buffer (box of 6 pints)
603824	Assorted Case (2 pints each of pH 4, 7, and 10 buffers)

External temperature sensors are available for electrodes that do not have an integrated temperature sensor.



ScienceLine Temp 135 and ScienceLine Temp 136 Sensors

Potassium chloride (3 M KCl) solution is available (109 705Y) for refillable electrodes. 3 M KCl is also the recommended storage solution for all YSI lab pH electrodes.

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